

# PolyGen: An Autoregressive Generative Model of 3D Meshes

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## Abstract

Polygon meshes are an efficient representation of 3D geometry, and are of central importance in computer graphics, robotics and games development. Existing learning-based approaches have avoided the challenges of working with 3D meshes, instead using alternative object representations that are more compatible with neural architectures and training approaches. We present an approach which models the mesh directly, predicting mesh vertices and faces sequentially using a Transformer-based architecture. Our model can condition on a range of inputs, including object classes, voxels, and images, and because the model is probabilistic it can produce samples that capture uncertainty in ambiguous scenarios. We show that the model is capable of producing high-quality, usable meshes, and establish log-likelihood benchmarks for the mesh-modelling task. We also evaluate the conditional models on surface reconstruction metrics against alternative methods, and demonstrate competitive performance despite not training directly on this task.